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NEW HAMPSHIRE COLLEGE

Agricultural Experiment Station

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# FIFTEENTH ANNUAL REPORT

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

DURHAM

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

# AGRICULTURAL EXPERIMENT STATION

DURHAM, N. H.

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# FIFTEENTH ANNUAL REPORT.

## ANNUAL STATEMENT

Of the Hatch Fund of the New Hampshire College of Agriculture and the Mechanic Arts, for the year ending June 30, 1903.

### Receipts.

| | |
|---|---|
| Cash received from United States treasurer | $15,000.00 |

### Expenditures.

| | |
|---|---|
| Cash paid for salaries | $9,306.88 |
| labor | 1,379.52 |
| publications | 1,570.67 |
| postage and stationery | 105.81 |
| freight and express | 218.19 |
| heat, light, and water | 387.29 |
| chemical supplies | 97.81 |
| seeds, plants, and sundry supplies | 380.42 |
| fertilizers | 49.90 |
| library | 316.87 |
| tools, implements, and machinery | 25.14 |
| furniture and fixtures | 70.50 |
| scientific apparatus | 382.44 |
| traveling expenses | 558.72 |
| contingent expenses | 15.00 |
| building and repairs | 134.84 |
| | $15,000.00 |

We, the undersigned, duly appointed auditors of the corporation, do hereby certify that we have examined the books and accounts of the New Hampshire Agricultural Experiment Station for the fiscal year ended June 30, 1903; that we have found the same well kept and classified as above, and that the receipts for the year from the treasurer of the United States are shown to have been $15,000, and the corresponding disbursements,

$15,000; for all of which proper vouchers are on file and have been by us examined and found correct.

And we further certify that the expenditures have been solely for the purposes set forth in the act of congress approved March 2, 1887.

Signed,

ROSECRANS W. PILLSBURY,
G. BYRON CHANDLER,
*Auditors.*

Attest:
WALTER M. PARKER,
*Custodian.*

## SUPPLEMENTARY STATEMENT.

### RECEIPTS.

| | |
|---|---|
| Cash received, analytical fees, etc. | $1,209.97 |

### EXPENDITURES.

| | |
|---|---|
| Cash paid for salaries and labor | $899.58 |
| postage, freight, and express | 8.58 |
| heat, light, and water | 193.77 |
| apparatus and supplies | 93.04 |
| contingent expenses | 15.00 |
| | $1,209.97 |

# REPORT OF THE VICE-DIRECTOR.

FRED W. MORSE.

The working year of the Agricultural Experiment Station has been fixed to include the time between November 1 and October 31, in order to comply with the statutes governing the annual reports of state institutions. The financial year covers the period from July 1 to June 30, to conform to the fiscal year of the national government, from which the Station receives its funds.

During ten months of the year just closed, viz., from November 1, 1902, to September 1, 1903, the Agricultural Experiment Station was in charge of the vice-director and chemist. During the spring and summer, he was also obliged to assume charge of the agricultural department, owing to the resignation in March of the agriculturist, Prof. Harry Hayward, who was appointed assistant chief of the dairy division, United States department of agriculture.

Eight bulletins in the regular series, one technical bulletin, and one nature leaflet have been issued during the year, namely :

Number 97. Inspection of Fertilizers by Fred W. Morse.

Number 98. Inspection of Feeding-Stuffs by Fred W. Morse.

Number 99. A Selected List of Vegetables for the Garden by Frank Wm. Rane.

Number 100. The White Fly of Greenhouses by Clarence M. Weed and Alfred F. Conradi.

Number 101. Fungous Diseases by Herbert H. Lamson.

Number 102. Insect Record by Clarence M. Weed.

Number 103. Standard Milk by Fred W. Morse.

Number 104. Fifteenth Annual Report.

Technical Bulletin Number 6. Parasites of the American Tent Caterpillar by William F. Fiske.

Nature Study Leaflet Number 4. Wild Flowers of New Hampshire by Clarence M. Weed.

September 1, 1903, the vacancies in the administrative and agricultural departments were filled by the appointment of William D. Gibbs, M. S., as director, Frederick W. Taylor, B. S., as agriculturist, and Edward L. Shaw, B. S., as associate agriculturist in charge of animal husbandry. The department of botany was at this time consolidated with the department of entomology, Dr. H. H. Lamson having resigned to accept another position. Mr. J. C. Bridwell was appointed assistant entomologist in place of Mr. A. F. Conradi, who was called to the Texas station.

The progress of the Station departments will be found under the appropriate headings, as reported by the officers in charge.

# DEPARTMENT OF CHEMISTRY.

### Fred W. Morse.

During the year the department has coöperated with the State Board of Agriculture in the inspections of feeding stuffs and fertilizers. Fifty-seven samples of commercial feeding-stuffs were analyzed in the early part of the year, and the results published in Bulletin No. 98.

During the summer ninety-three brands of fertilizers were analyzed and the data has been prepared and will be issued early in the new year.

The department has had more work for the public than usual. It has aided the farmers directly by numerous analyses of milk for milk producers whose product was not up to the legal standard, and a short bulletin has been issued to inform the public about the milk-standard and how to comply with it.

Thirty-four samples of cattle and poultry foods have been analyzed in addition to those examined for the Board of Agriculture, and the results are deemed of sufficient interest to be here tabulated. Six samples of cotton-seed meal were received from farmers in the following towns, representing widely separated localities: Plymouth, Lebanon, West Chesterfield, Concord, and Campton. Protein only was determined in these samples, and it ranged from 38.9 per cent. to 45.4 per cent., averaging 42.3 per cent. As yet, we have found no evidence of inferior cotton-seed meal in the state.

The following cattle-foods were received from various sources.

Two of the brans, viz., Washburn Crosby Co.'s and Sheffield King Milling Co.'s, are a new class of this favorite cattle-food. They are very flaky in texture and free from flour. It will be noticed, however, that they are low in protein.

## COMPOSITION OF CATTLE-FOODS.

| | Locality. | Protein. | Fat. |
|---|---|---|---|
| Gluten Feed, "Queen" | Pittsfield | 22.91 | 2.78 |
| Gluten Feed, "Globe" | College | 26.87 | 3.58 |
| Gluten Feed, "Buffalo" | College | 24.13 | 5.15 |
| Gluten Feed | College | 23.17 | 2.19 |
| Wheat Bran | Bath | 15.47 | 4.53 |
| Wheat Bran, Pillsbury's | College | 15.28 | 5.41 |
| Wheat Bran, Washburn Crosby Co.'s | College | 13.42 | 5.04 |
| Wheat Bran, Stratton's | Bath | 17.55 | 4.07 |
| Wheat Bran, "Empire" | Bath | 17.55 | 6.30 |
| Wheat Bran, Sheffield King Milling Co.'s | College | 13.77 | 6.40 |
| Oat Feed | Contoocook. | 10.75 | 3.68 |
| Oat Feed | Keene | 6.96 | 3.00 |
| Oat Feed, "Haskell's Stock Food" | Rochester | 9.03 | 7.60 |

## COMPOSITION OF POULTRY FOODS.

| | Locality. | Protein. | Fat. |
|---|---|---|---|
| Shredded Wheat | Milford | 10.71 | 1.65 |
| Biles's XXXX Distiller's Grains | Milford | 36.33 | 7.90 |
| Hominy Meal | Milford | 12.11 | 3.30 |
| "Red A" Oat Middlings | Milford | 21.76 | 7.60 |
| Keith's Animal Meal | Milford | 51.16 | 2.80 |
| Darling's Beef Scrap | Milford | 59.49 | 13.15 |
| Lord's Meat Scrap | Milford | 51.69 | 17.80 |
| Whitman & Pratt's Animal Meal | Milford | 38.08 | 12.80 |
| Animal Meal | Rindge | 28.18 | 11.32 |
| Darling's Animal Meal | Rumney | 45.20 | 15.30 |
| Bradley's Superior Meat Meal | Rumney | 35.90 | 7.30 |
| Bowker's Animal Meal | Rumney | 35.10 | 8.70 |
| Bowker's Meat Scrap | Littleton | 59.31 | 15.75 |
| Meat Scrap | Littleton | 46.12 | 15.25 |
| Meat Scrap | Littleton | 44.66 | 17.35 |
| Romaine's Boiled Beef and Bone | Littleton | 42.46 | 17.65 |
| Bowker's Ground Beef Scrap | Littleton | 46.94 | 13.80 |

A large part of our feeding-stuffs were received from poultry growers and are therefore grouped as poultry foods.

A dead pigeon was received from Portsmouth together with a small sample of corn gathered from the surface of a field from which it was thought the bird might have picked up some kernels that had been poisoned.

The organs of the pigeon and the contents of its crop were separately tested for strychnine, and very decided reactions obtained, particularly from the crop contents. The corn from the field showed no poison. However, it was noticed that the corn in the crop was a yellow flint, while that from the field was a dent variety, apparently Leaming.

It is a not uncommon practice for farmers to expose corn soaked in strychnine solution, in order to stop the ravages of crows. It is a dangerous practice and is a violation of the laws of the state which read as follows:

> "If any person shall in any way or place wilfully expose an active poison for the destruction of any animal or for any other purpose except the destruction of rats or other vermin in his own buildings or upon his potato crops, he shall be fined not exceeding fifty dollars, or be imprisoned not exceeding six months, or both."—Section 14, Chapter 266.

The investigations of the department were much broken up by the change in assistants during the year. Mr. A. L. Sullivan, a graduate assistant, resigned in February to accept a position in the Bureau of Internal Revenue, at Washington, D. C., and in July Mr. L. A. Hill, assistant chemist, resigned to accept a position in the research laboratory of the MacLean hospital, Boston. Mr. Harold H. Scudder, recently graduated from Dartmouth college, was appointed assistant chemist July 1st.

Investigations on the acids of corn silage, effect of frost on corn, enzymes in apples and corn fodder, and the respiration of apples at different temperatures have been carried on as opportunity permitted.

## DEPARTMENT OF AGRICULTURE.

FRED W. MORSE.

The investigations in this department were limited to field experiments, continuing the rotation of crops begun last year, and testing a number of varieties of corn and forage crops. The weather conditions were extremely unfavorable to our common crops, hence the less common kinds were, as a rule, worthless. Corn failed almost entirely. Winter rye, oats, Canada peas, clovers, timothy, and redtop gave excellent yields of forage. The smaller types of millet, Hungarian grass, and Russian millet were satisfactory, and rape grew well. Three twentieth-acre plats were seeded with alfalfa, July 2, and an excellent stand was secured. But another season is required to determine whether it will withstand the winter.

The often recurring changes in the management of this department have, of course, resulted in a lack of continuity of investigations and a considerable amount of scattering data. It is planned to have these data assembled and edited during the coming year.

Mr. Herbert M. Tucker, superintendent of the farm, resigned his position April 1, and was succeeded by Mr. Percy A. Campbell, who executed the field work of the season.

# DEPARTMENT OF ENTOMOLOGY.

CLARENCE M. WEED.

The work of the year has followed somewhat closely along the lines of previous seasons, with important advances in the way of facilities for field work and the quarters for investigation.

The passage by the legislature of the nursery inspection law and the subsequent appointment by the State Board of Agriculture of the Station entomologist as nursery inspector has made possible and necessary more field work in studying the injurious insects of the state. The department has been moved into more commodious quarters in Nesmyth hall, this being made possible through the removal of the departments of agriculture and horticulture into Morrill hall.

The investigations and experiments of the year have been chiefly with regard to the following insects :

The Brown-tail Moth.
The San José Scale.
The Black Flies.
The Striped Cucumber Beetle.
The Cabbage Worm.

With all of these insects new material for bulletins has been obtained for publication the coming year. Other bulletins upon other insects were published during the year, the list of which will be found on an earlier page.

Mr. Albert F. Conradi, who for some time has been so efficient as assistant entomologist, resigned in August to accept a more lucrative position, and Mr. J. C. Bridwell was elected to the position in September. During the summer Mr. J. L. Randall served acceptably as assistant in economic work.

# DEPARTMENT OF HORTICULTURE.

F. Wm. Rane.

The work in this department has followed the general lines heretofore outlined for our investigations in fruit growing, vegetable gardening, floriculture, and forestry.

A new experimental orchard of about five acres was set last spring. This contains a large number of varieties; also various experiments in the nature of cultivation, utilization of rocky soils, fillers, etc. Many observations and experiments in growing all kinds of fruits for New Hampshire have been made. A fruit bulletin is under way which will consider the general question of all varieties of fruits grown in the state and recommend varieties thought to be of most value. Other fruit problems are also under consideration.

A bulletin on vegetable gardening was completed and published during the year. It was our purpose to emphasize the better varieties for planting therein. The usual variety trial tests were made. The season was a poor one but, everything considered, resulted favorably. Even numerous varieties of squashes and pumpkins gave fair success.

The department has constructed during the year a complete new range of greenhouses for which it was given $7,000 by the legislature last winter. The old greenhouses were torn down and much of the material utilized in the new structure. The new range (see Fig. 1) is composed of a palm house (7), 25 by 55 feet and 18 feet high at the peak; four wings (3, 4, 5, 6), connecting into the palm house, two on either side, each 20 by 37½ feet and 12 feet high at peak. Connecting with the rear of the palm house is a runway (8, 9), 10 feet wide at ends and 34 feet long, extending back to the potting house. Midway of this, running at right angles and connected with it, are two more greenhouse wings (1, 2), each 20 by 47½ feet and 12 feet high. The potting house (10) is 20 by 30 feet. The basement is utilized as a boiler house. A soil bin is also placed here. The first or main floor is utilized for a general work room and office for doing up packages, weighing, etc. (d). A large closet (c) is partitioned off for holding the working frocks of students and attendants. A second closet (e) contains the tools and implements. Under the working benches (a) are cupboards for different sizes of flower pots. The attic is partitioned off into two rooms, one for the greenhouse attendant and the other for a store room. The potting house is furnished with a telephone.

The greenhouses are planned for experimental work. Each house contains sufficient piping to grow plants at either high or low temperatures. The houses are so connected that while each is separate from the other the partitions are of glass and their contents are visible from the palm house (7) or passage ways (8, 9). By being able to lock each of the side houses (1, 2, 3, 4, 5, 6), the experimental work is not interfered with. The material for the houses was purchased from the Lord & Burnham company, greenhouse contractors and builders. The palm house (7) and the four wings (houses 3, 4, 5, 6) connected to it are of iron frame construction and erected by that company. Houses 1 and 2 and runway 8, 9 are constructed on the same principles as the former as far as iron posts, gutters, and purlines are concerned, but the roof is made of cypress rafters entirely and the houses are supported by iron posts. In order to have a variety, three kinds of apparatus for lifting ventilators have been put in, the Evans, Lord & Burnham, and the Hub. Houses 2 and 4 have been fitted up for vegetable houses and have ground beds. The remaining houses have raised benches, excepting bed *a* in the palm house (7), which is a ground bed. House 1 has been planned for a laboratory in floriculture. Each student has his bench room assigned to him and here carries on his practical work in floriculture, as mixing soils, making cuttings, watering, transplanting, germinating seeds, etc. Benches *a* and *b* in house 8 and *a* and *b* in house 9 (the runways) are cutting benches. They are so built that bottom heat can be controlled beneath by opening or shutting slide doors as occasion demands.

The whole range is to be wired for electric lighting, is to have cement walks, etc. While there may be more expensive ranges throughout New England, I believe there are none better arranged for the purpose intended. For work in instruction along this line we believe there are no institutions better equipped.

The experimental work in forestry thus far has been carried on under the head of horticulture in the Experiment Station. Various investigations and experiments have been going on for some time in forestry. A bulletin on "Waste Lands Adapted for Forestry" will be in press shortly.

Throughout the year Mr. Harry F. Hall, the assistant horticulturist, has been untiring in his efforts to make the work in the department a success.

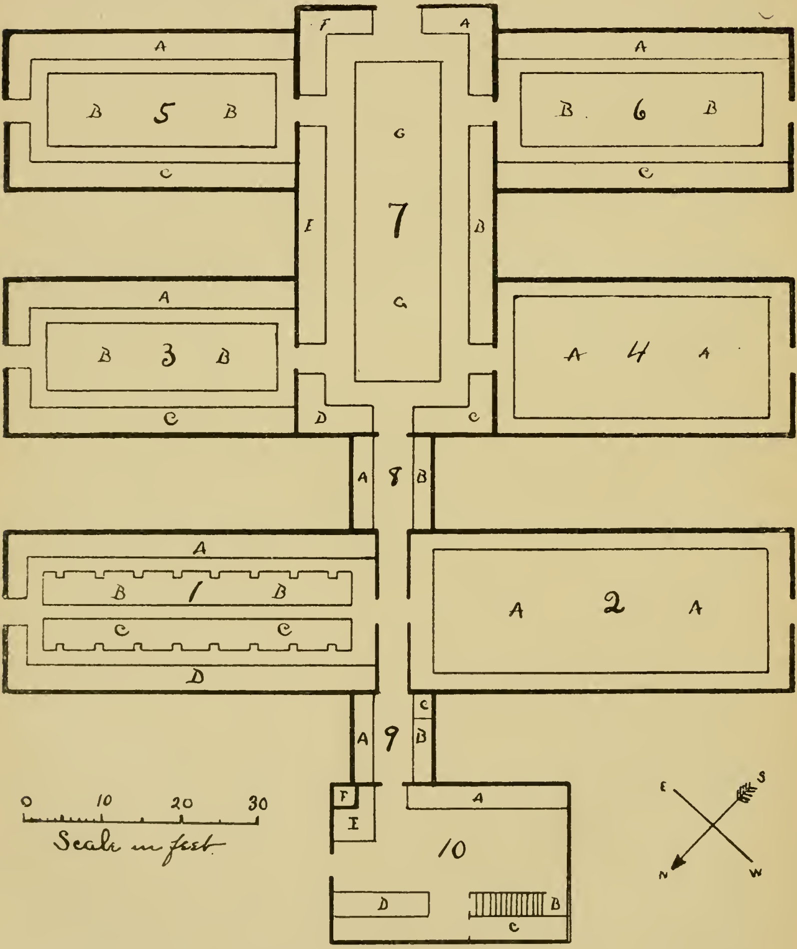

FIG. 1.—Plan of Greenhouses.

# PUBLICATIONS OF EXPERIMENT STATION.

The following publications of the Station are available for distribution:

No. 2. Feeding Experiments.
No. 3. When to cut Corn for Ensilage.
No. 4. The Science and Practice of Stock-Feeding.
No. 5. Fertilizers and Fertilizing Materials.
No. 6. Experiments with Fertilizers.
No. 7. Test of Dairy Apparatus.
No. 8. Feeding Experiments. Part 1. Principles of Feeding. Part 2. Corn Meal, Middlings, Shorts, and Cotton-Seed Compared.
No. 9. Effect of Food upon Milk.
No. 11. Pig Feeding. Part 1. Results of Feeding Skim Milk and Corn Meal versus Corn Meal and Middlings. Part 2. Digestion Experiment.
No. 12. Fertilizer Experiments.
No. 14. Ensilage in Dairy Farming.
No. 16. Effect of Food on Composion of Butter Fat.
No. 17. Stock Feeders' Guide.
No. 18. Effect of Food on Milk.
No. 19. Spraying Apples and Pears against Fungi.
No. 20. Effect of Food on Milk. Feeding with Fats.
No. 21. Farmyard Manures and Artificial Fertilizers.
No. 22. Prevention of Potato Blight.
No. 23. Some Dangerous Fruit Insects.
No. 24. The Flow of Maple Sap.
No. 25. The Composition of Maple Sap.
No. 26. Analysis of Fertilizers and Wood Ashes.
No. 27. Spraying Experiments in 1894.
No. 28. Remedies for the Horn Fly.
No. 29. Remedies for Flea Beetles.
No. 30. An Experiment in Road Making.
No. 31. Seventh Annual Report. 1895.
No. 32. Studies of Maple Sap.
No. 33. Two Shade-Tree Pests.
No. 34. Surface and Sub-Irrigation out of Doors.
No. 35. The Codling Moth and the Apple Maggot.
No. 36. Analyses of three Common Insecticides.
No. 37. Crimson Clover.
No. 38. The Tent Caterpillar.
No. 39. The Army Worm.
No. 40. Eighth Annual Report. 1896.
No. 41. Potatoes: Varieties, Fertilizers, Scab.
No. 42. Part 1. Tomato Growing in New Hampshire. Part 2. Notes on Tomato Breeding.
No. 44. The Cankerworm.
No. 45. Fruit and Potato Diseases.
No. 46. Part 1. An Experiment with a Steam Drill. Part 2. Methods of Road Maintenance.

No. 48. Ninth Annual Report. 1897.
No. 53. The Farm Water Supply,
No. 56. Poisonous Properties of Wild Cherry Leaves.
No. 57. Forage and Root Crops.
No. 58. Cost of Raising Calves.
No. 59. Tenth Annual Report. 1898.
No. 60. Green Corn under Glass.
No. 61. Inspection of Fertilizers in 1898.
No. 62. Forcing Pole Beans under Glass.
No. 64. The Forest Tent Caterpillar.
No. 66. Experiments in Pig Feeding.
No. 67. The Spiny Elm Caterpillar.
No. 68. Eleventh Annual Report. 1899.
No. 69. Inspection of Fertilizers in 1898.
No. 70. Experiments with Muskmelons.
No. 71. Corn Culture.
No. 72. Insect Record for 1899.
No. 74. Growing Strawberries in New England.
No. 75. The Forest Tent Caterpillar. Second Report.
No. 76. Utilizing the Greehouse in Summer.
No. 77. Experiments in Road Surfacing.
No. 78. Bovine Tuberculosis.
No. 79. Twelfth Annual Report. 1900.
No. 80. Inspection of Fertilizers in 1900.
No. 81. Insect Record for 1900.
No. 82. Feeding Farm Horses.
No. 83. Value of Meadow Muck.
No. 84. Forcing Dwarf Tomatoes.
No. 85. Remedies for the Cankerworm.
No. 86. Growing Watermelons in the North. Classification of Watermelons.
No. 87. Thirteenth Annual Report. 1901.
No. 88. Inspection of Fertilizers, 1901, Analyses of Ashes, etc.
No. 89. The Squash Bug.
No. 90. Insect Record for 1901.
No. 91. Killing Woodchucks with Carbon Bisulphide.
No. 92. Silage Studies.
No. 93. The Cold Storage of Apples.
No. 94. Remedies for Fleas.
No. 95. How to Grow a Forest from Seed.
No. 96. Fourteenth Annual Report. 1902.
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No. 98. Inspection of Feeding-Stuffs. 1902.
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No. 100. White Fly of Greenhouses.
No. 101. Fungous Diseases and Spraying.
No. 102. Insect Record. 1902.
No. 103. Standard Milk.
No. 104. Fifteenth Annual Report. 1903.

# BULLETIN

OF THE

# NEW HAMPSHIRE COLLEGE

# AGRICULTURAL EXPERIMENT STATION

## 1902-1903

NUMBERS 97 TO 104

AND

## FIFTEENTH ANNUAL REPORT

New Hampshire College
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM

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